

Preface

Technological innovation is nowadays called to fulfill societal demand for new and high value-added products coping with the requirements of a sustainable development. The features of the markets and the urgency of a problem such as global warming, health, and well-being require to reduce the time to market new industrial processes and products. Thus, engineers are called more and more to assess and manage the associated risk under growing time pressures. Negative risk turning into an accident is a possibility that, if it occurs, adversely affects the ability of an undertaking to achieve its outcome objectives. Engineering risk management is the process of identifying risk, assessing risk, and taking steps to reduce it to an acceptable level. Engineering risk management can be defined as the early and continuous identification, assessment, and resolution of nonfinancial risks such as the most effective and efficient decisions can be taken to manage these risks.

A substantial body of knowledge has been developed around risk management, and some books dealing with engineering risk management have also been published, particularly by some of the authors of this book.

However, if the interest of considering engineering risk management is no more to be demonstrated, the way risk and safety concepts should be learned, taught, and acquired by the learners and engineers still remains of significant interest. Indeed, while the world has changed from an individual customer point of view, the way students (and also professionals in continuous training) learn has also moved a lot.

On the one hand, while the engineer's job evolves, the number of technical and nontechnical skills and knowledge to be covered by the learners during their training, and to master before graduation, has widely increased. In these conditions, with constant training duration, the teachers may have to spend less time on a given subject, and thus they need to be more efficient and make good choices to clearly deliver and illustrate the subject they want to cover.

On the other hand, new students learn differently. The Y generation, or digital natives, is characterized, among others, by its

- Connectivity and its ease with technological tools: They think “on the net” and know/feel that the more they are connected, the stronger they are. Social networks are also a part of everyday life.
- Impatience: They are always connected to the digital world; their access to information is instantaneous.
- Inventiveness: The improvement is no longer continuous, and intercultural settings and interdisciplinary solutions promote innovation.
- Different relationships with authority, including teachers: Authority is no longer related to a status, but must be demonstrated through competence and behavior.

In such conditions, the classical forms of teaching are no longer suitable, and new ways of teaching, based on the use of numerical devices, interactivity, active learning and teaching, group work, role playing, and so on have emerged and are successfully used by many teachers around the world. The main characteristic of these methods is to provide so-called active or interactive learning, where the learners are called to play an active role in the learning process.

It is thus a real pleasure to welcome and introduce such a book dealing with engineering risk management and its education. Thierry Meyer is professor of Chemical Engineering and Safety and Risk Management at the Federal Institute of Technology in Lausanne (EPFL), Switzerland, and Swiss academic delegate in the Working Party Education of the European Federation of Chemical Engineering. Genserik Reniers, chemical engineer by education, is also professor of Safety and Security Engineering and Management at both the KU Leuven. Valerio Cozzani is professor of Chemical, Engineering and Director of Academic Programs for the Department of Chemical, Environmental and Civil Engineering at the University of Bologna in Italy, also specialized in Process and Environmental Safety, and particularly involved in didactic interventions on Process Safety Engineering both in academia and in professional training.

By publishing this book, they now allow, being part of the scientific community, for the teachers and learners of different universities and levels, to access all their skills and knowledge on the teaching of engineering risk management.

An introduction to risk and safety management and their relation with chemical engineering is given in the first chapter. The need for engineering risk management education, from the regular education as well as a continuous training point of view, and the importance of education for prevention are then highlighted in the second chapter. The third chapter details the different education profiles for risk management, for both a classic risk manager profile and a continuing education profile, and it also covers the different forms of safety education. The different learning characteristics and outcomes are then fully described in the fourth chapter: what, when, to whom, how, should Engineering Risk Management be taught, and how should it be tested? This chapter also gives an overview of actual researches about risk management education and learning outcomes, recent findings on safety education, perspectives about engineering risk management and different industrial sectors needs and expectations. Finally, examples of safety or risk management education programs, courses, and contents, for different universities and within different countries, are given in the fifth chapter, including illustrative courses, exams, and future thoughts. The book ends with conclusions and perspectives on risk management education, new technologies for education and networking, as well as competences and resources for education.

This complete and well-documented book takes advantage from all the academic, industrial, and international experiences of its authors. It will be useful to students, learners, teachers, and engineers who have to deal with engineering

risk management and its education. I warmly thank Thierry Meyer, Genserik Re-niers, and Valerio Cozzani for their important and original contributions to the subject.

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